

REMARKS

Status of the claims

Claims 1, 4-5, and 7-25 are currently pending. Claims 1, 4, 11, 13-18, and 20-22 have been amended. Specifically, claims 11 and 20-22 were amended by incorporating the process for preparing the polymer. Support for these amendments can be found in claim 1 of the application. Additional amendments are described more fully immediately below. Claims 3 and 6 have been cancelled. Applicants reserve their rights to pursue all cancelled subject matter in a continuing application.

In light of the amendment described above, claim 11 is now independent.

Claim 1 has also been amended by incorporating the limitation "and wherein said polypropylene polymer composition has improved scratch resistance." Support for this amendment may be found on page 1, paragraph [0001] and on page 2, paragraph [0010] of the substitute specification. Claims 11, 20, 21, and 22 were amended in the same way.

In addition, claim 1 has been amended to recite "feeding only propylene to at least one slurry reactor." Support for this amendment can be found in the substitute specification, for example on page 4, paragraphs [0024] and [0025], as well as in the Examples on pages 12 and 13. Claims 11, 20, 21, and 22 were amended in the same way.

Claim 1 has further been amended to delete "a" in step (i). Claims 11, 20, 21, and 22 were amended in the same way.

Further, the subject matter of present claim 3 was incorporated into claim 1, wherein "in one GPR reactor" was amended to "in the first GPR reactor". Support for this amendment can be found in the substitute specification, for example on pages 5 and 6, paragraphs [0033] and [0034]. Claims 11, 20, 21 and 22 were amended in the same way. As a result of these amendments, claim 3 has been cancelled. As a result of the cancellation of claim 3, claims 4 and 13-18 have been amended to depend from claim 1.

Claim 20 was further amended by incorporating the subject matter of claim 9, from which it depended. Claim 20 is now independent.

Claim 21 was further amended by incorporating the subject matter of claim 10, from which it depended. Claim 21 is now independent.

Claim 22 was further amended by incorporating the subject matter of claim 19, from which it depended. Claim 22 is now independent.

No new matter has been added by these amendments.

Claim Objections

Claims 11 and 20-22 stand rejected as allegedly failing to further limit the subject-matter of a previous claim. Applicants submit that the amendments made to claims 11 and 20-22 (described above) render these rejections moot. Consequently, reconsideration and withdrawal is respectfully requested.

Rejections Based on 35 U.S.C. §112

Claims 1, 4-5, and 7-25 stand rejected as allegedly containing subject matter not described in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Without conceding the correctness of the rejection, but in an effort to expedite the prosecution of this application, Applicants have removed the phrase "average molecular weight" from the claims. In light of this amendment, reconsideration and withdrawal of this rejection is requested.

Claims 1, 4-5, and 7-25 stand rejected as allegedly not enabling "any type of molecular weight measurement." (Emphasis in the original.) Without conceding the correctness of the rejection, but in an effort to expedite the prosecution of this application, Applicants have removed the phrase "average molecular weight" from the claims. In light of this amendment, reconsideration and withdrawal of this rejection is requested.

Claims 1, 4-5, and 7-25 stand rejected as allegedly being indefinite for failing to point out and distinctly claim the subject matter which applicant regards as the invention. Without conceding the correctness of the rejection, but in an effort to expedite the prosecution of this application, Applicants have removed the phrase "average molecular weight" from the claims. In light of this amendment, reconsideration and withdrawal of this rejection is requested.

Rejections Based on 35 U.S.C. § 103

Claims 1, 4-5, and 7-25 stand rejected as allegedly being obvious over Huovinen et al., (U.S. 6,503,993); Pitkanen et al., (U.S. 6,342,564); or Govoni et al., (U.S. 5,610,244). These rejections are made in the alternative, i.e., the Office alleges that each reference, independent of the other references, renders the instant claims obvious. Applicants respectfully disagree.

The Obviousness Rejection based on Huovinen, et al.

The Office alleges that Huovinen, et al., (hereinafter, "Huovinen") renders the instant claims obvious. Applicants respectfully disagree.

Applicants submit that Huovinen does not teach each limitation of the currently pending claims, and as such, the Office has not established a *prima facie* case of obviousness.

Huovinen is directed towards efficiently nucleated propylene homo- and copolymers. See Column 1, lines 11-13. More specifically, Huovinen describes "Polymerization of propylene optionally with comonomers in the presence of a transesterified Ziegler-Natta catalyst system comprising a strongly coordinating external donor will yield a nucleated polymer..." See Column 2, lines 9-13. Much of Huovinen is directed towards the particular catalyst, which is used to make the polymerized propylene. See generally Column 5, line 22 to Column 8, line 7.

Huovinen describes the polymerization reactor system as comprising "any polymerization reactors of conventional design for producing propylene homo- or copolymers. The polymerization reactor system can comprise one or more conventional stirred-tank slurry reactors ... or one or more gas phase reactors." See Column 8, lines 17-22. Preferred reactors are "selected from the group of loop and gas phase reactors." Column 8, lines 22-23. A particularly preferred set up is "loop and gas phase reactors in a cascade." See Column 8, lines 34-40. The polymerization reactors "can also include a number of additional reactors, such as pre- and/or post reactors." See Column 8, lines 56-65.

In contrast to the teachings of Huovinen, the instant claims are directed towards a specific combination of monomers, which is reacted in a specific combination of reactors,

thereby affording the desired, polymeric product. In the instant claims, three main steps are carried out:

- 1.) homo-polymerization of propylene in at least one slurry reactor to produce product (a)
- 2.) feeding product (a), ethylene and propylene to the first gas phase reactor to produce a propylene rich ethylene-propylene-rubber (b)
- 3.) feeding product (b), ethylene and propylene to the second gas phase reactor to produce an ethylene rich ethylene-propylene-rubber (c).

This specific combination of features is not taught or suggested by Huovinen; not in the general disclosure, nor in the examples. Additionally Huovinen would not motivate a person to invent the claimed subject matter. There is simply nothing in Huovinen that would lead a skilled person to invent the claimed subject matter.

The Office alleges that at column 16, example 8, a high molecular weight fraction produced prior to a lower molecular weight fraction is recited. While Huovinen teaches how varying the amount of hydrogen impacts the molecular weight of a polymer, Huovinen is totally silent with respect to the adjustment of the ethylene/propylene ratio. In addition, in the Advisory Action, the Office states “[t]he particular ratios of monomer to comonomer are not recited in the instant claims [...]” Applicants respectfully disagree. In view of the newly amended claims, the ratios of the monomers are now clearly indicated, wherein Huovinen is silent with respect to the specific ratio of ethylene/propylene. Therefore, the differences between the present invention and Huovinen are:

- the specific combination of process steps (i.e. homo-polypropylene polymer matrix in a slurry reactor; forming a propylene rich ethylene-propylene rubber (EPR) in the homo-propylene polymer matrix in a first gas phase reactor; and forming an ethylene rich EPR in the propylene polymer matrix in the second gas phase reactor and
- the specific ratio of propylene/ethylene in the gas phase reactors.

Consequently, Huovinen does not teach each claim limitation, and as a result, the Office has not established a *prima facie* case of obviousness.

The Applicants have also unexpectedly found that the ratio of ethylene/propylene in the different preparation steps [first step = only propylene; second step = propylene > ethylene; third step = propylene < ethylene] is very important and leads to polymers having superior properties, i.e. more stiffness/hardness to the surface, which improves the resistance to scratch damage. This superiority in scratch resistance can be clearly taken from the Examples 1-5 in the present application. Scratch evaluation was carried out by measuring the DeltaL (dL) value by means of a spectrophotometer, wherein DeltaL > 4 means "strong visibility of scratch" and DeltaL < 1 means "significant lower visibility of scratch". By using the inventive process, polymer materials can be obtained which have a dL value of less than 4 and thus, polymers with an improved scratch resistance are obtained. The test samples demonstrate a surprising and unexpected improvement in scratch resistance, as indicated by the low DeltaL (dL) values that were obtained. Applicants submit that the skilled man would not find any teaching in Huovinen, or any other reference, correlating scratch resistance and the ratio of propylene and ethylene in the different steps of the preparation cycle. As a result, the superior scratch resistance of the polymers made using the claimed methods was surprising and unexpected.

In the Advisory Action, the Office states, "[...] a skilled artisan would have a high level of expectation of success following the teachings of the reference, using known constituents in known methods to produce predictable results." Applicants respectfully disagree.

In a complicated preparation process wherein numerous possibilities of variation exist, there is no "predictable result" if one starts with no particular indication for a promising starting point in order to prepare polymers having improved scratch resistance. First, the combination and number of reactors have to be chosen. Second, it has to be determined which kind of polymers will be produced in the respective reactors. Third, the ratios of the monomers in each reactor have to be established. This very specific combination of reactors, olefin monomers, and ratios of the respective olefin monomers is not described in Huovinen nor derivable there from. Further, it is not obvious from

Huovinen that the claimed process will lead to a polypropylene polymer composition with an improved scratch resistance as claimed and as shown in the Examples. The skilled man is not provided with any information in Huovinen enabling him to adjust a preparation process for a polymer composition with such numerous possibilities for variation.

Further, in the Advisory Action the Office also states, "[...] *applicants have not shown with any comparative testing that a composition produced using the teachings of Huovinen et al would not have 'improved scratch resistance.'* [...]" Applicants respectfully disagree.

As already indicated above, it is not possible to choose a starting point in Huovinen for any reasonable comparative example. There are too many variables to choose from, which would put an undue burden on the skilled man. Such a comparative example can only be conducted with the knowledge of the process of the present invention. Applicants respectfully submit that such hindsight reconstruction of the claimed subject matter is improper. Further, Huovinen is completely silent with respect to the feature of "improved scratch resistance" and thus a comparison is not possible. From the Examples of the present invention it can be learned that even "minor" variations have a measurable impact on the scratch resistance. Thus, starting from Huovinen, which does not teach about the specific process steps as presently claimed, it would not be obvious to one of ordinary skill in the art that it is possible to prepare polymers with improved scratch resistance. Thus, the specific process steps of the present invention unexpectedly lead to polymers with improved scratch resistance. In light of the above, the Applicants submit that the claimed subject matter is not obvious in light of the disclosure of the Huovinen patent. Consequently, they request reconsideration and withdrawal of this rejection.

The Obviousness Rejection based on Pitkanen et al

The Office alleges that Pitkanen, et al., (hereinafter, "Pitkanen") renders the instant claims obvious. In particular, the Office points to Column 3, lines 54-60 and Column 4, lines 5, et seq. as referring to the control of the molecular weights of each polymerization phase through addition of hydrogen as being "conventional." The Office also points to the examples of Pitkanen as supporting its position. Applicants respectfully disagree.

Applicants submit that Pitkanen does not teach each limitation of the currently pending claims, and as such, the Office has not established a *prima facie* case of obviousness.

Pitkanen is directed towards polymers having a low tensile modulus. *See* Column 2, line 5-9. Pitkanen's method is as follows:

another aspect the invention provides a process for the preparation of a heterophasic polypropylene copolymer having a tensile modulus of 420 MPa or less comprising:

- i) producing a semi-crystalline propylene:ethylene and optionally other .alpha.-olefin copolymer matrix in one or more slurry reactors and optionally one or more gas phase reactors;
- ii) followed by producing an elastomeric propylene:ethylene and optionally other .alpha.-olefin copolymer in the gas phase; characterised in that the transfer from liquid phase reactor to a subsequent gas phase reactor is effected without flashing to remove unreacted monomer.

It is explicitly stated in column 4, lines 5-37 that in the slurry reactor a polypropylene copolymer matrix is produced (not a propylene homopolymer, as in the instant claims) and that in the second gas phase reactor a propylene rich rubber is produced (not an ethylene rich EPR rubber, as required by the instant claims). Thus, totally different polymers, with different properties, are produced when using Pitkanen's method and that encompassed by the instant claims. As such, the methods are different. Additionally, there is no teaching or suggestion in Pitkanen that would lead a skilled person to invent the subject matter of the instant claims.

The Office's reference to the control of the molecular weight by the addition of hydrogen (cf. column 4, lines 38-40) is of no relevance here, because as discussed above, the ratio of ethylene/propylene is decisive.

In the Advisory Action, the Office states that "[w]ith regard to Pitkanen again it is pointed out that the first step recited in claim 1 does not exclude a copolymer being produced for the matrix." Applicant has amended independent claims 1, 11, and 20-22 to recite that only propylene is present in the slurry reactor. Thus, contrary to the teaching of Pitkanen, a homopolymer is produced in the instant claims.

Further, newly amended claim 1 clearly indicates that "*in the second gas phase reactor, an ethylene rich EPR rubber is produced in the propylene polymer matrix*" and "*whereby the polymerization conditions in the gas phase reactors are such that [...] in the other [second] GPR reactor B, the gas phase polymerization step is carried out by adding propylene and ethylene monomers where the resulting amount of C₂ in the EPR formed in gas phase reactor B is in the range from 77-99.9 mol%.*" Therefore, an ethylene rich EPR is formed, contrary to the propylene rich rubber in Pitkanen. Consequently, the overall composition of the claimed polymer is different from the polymer in Pitkanen and there is no teaching or suggestion in Pitkanen to modify the disclosed process to obtain polymers with improved scratch resistance. The same arguments above apply with respect to any comparative Examples.

In light of the above, Applicants submit that the Office has not established a *prima facie* case of obviousness. As a result, they request reconsideration and withdrawal of this rejection.

Applicants further note that their argument regarding surprising and unexpected results (above, where the Huovinen patent was discussed), apply with equal force to the rejection based on the Pitkanen patent. Thus, the claimed subject matter is not obvious in view of the teachings of Pitkanen. Consequently, reconsideration and withdrawal of this rejection is requested.

The Obviousness Rejection based on Govoni et al.

The Office alleges that Govoni, et al., (hereinafter, "Govoni") renders the instant claims obvious. Specifically, the Office argues that Figure 2 and Columns 4 and 5 describe polymerization steps that render the instantly claimed subject matter obvious. Applicants respectfully disagree.

Applicants submit that Govoni does not teach each limitation of the currently pending claims, and as such, the Office has not established a *prima facie* case of obviousness.

Govoni is directed towards a process for the continuous, gas phase polymerization of one or more olefins using a gas phase reactor, i.e., fluidised bed reactor, where the process is characterised by the fact that the make-up monomer or monomers are directly

sent to said fluidised bed reactor in one or more points above the fluidised bed. See Column 3, lines 7-55. Govoni also describes the use of hydrogen as a molecular weight regulator. See Column 6, lines 31-33 and Column 7, lines 45-47.

Govoni is silent with respect to the ratio of ethylene/propylene in the respective reaction steps and the influence of this ratio on the scratch resistance of the obtained polymer. In the Advisory Action, the Office states, "*it is pointed out that the compositional limitations for the ethylene and propylene monomers are not recited. The claims that refer to ethylene and propylene recite a specific amount of C2 in the EPR formed and do not recite monomer inclusion limitations, as argued.*" However, in view of the newly amended claims, the ratios of the monomers are now clearly indicated, wherein Govoni is silent with respect to the ratio of ethylene/propylene in the respective reaction steps and the influence of this ratio on the scratch resistance of the obtained polymer. Consequently, Applicants submit that the Office has not established a *prima facie* case of obviousness. As a result, they request reconsideration and withdrawal of this rejection.

Further, Applicants submit that a person of ordinary skill in the art, starting from Govoni, would not find any teaching, suggestion regarding how to amend the teachings of Govoni in order to invent the claimed subject matter. Moreover, in column 1, lines 42-53 of Govoni it is stated that "[i]t is in fact known that small variations in the operating conditions during the polymerization, resulting for example from small variations in the quality of the catalyst or of the olefin used in the reaction or from the dishomogeneity in the composition and in the flow rate of the gaseous mixture, can bring about changes in behaviour and catalytic activity of the polymer particles [...]." (Emphasis added). Polymerisation processes are carefully balanced systems and changing a single reaction by altering the ratio of the monomers used will have a significant and non-predictable impact on the properties of the resulting polymer. Thus, the skilled man would know that it is not possible to change the reaction parameters of a known process and predictably obtain an improved result. Consequently, the skilled man, starting with the teachings of Govoni, would not have a reasonable expectation of success in creating a polymer with improved scratch resistance. In light of the above, Applicants submit that the instant claims are not obvious in light of the teachings of Govoni.

Applicants further note that their argument regarding surprising and unexpected results (above, where the Huovinen patent was discussed), apply with equal force to the rejection based on the Govoni patent. Thus, the claimed subject matter is not obvious in view of the teachings of Govoni because the obtained results are surprising and unexpected. Consequently, reconsideration and withdrawal of this rejection is requested.

The Office also states in the Advisory Action, "[n]othing has been shown on the record as regards unexpected results." However, in the Examples section of the present application, the surprising effect of the process of the present invention with respect to scratch resistance of the produced polymers is emphasized. Unlike the present invention, Govoni is directed the problems of reactor fouling and fouling of the devices for transferring and discharging the polymer (*cf.* column 3, lines 7-11). Thus, a completely different polymer having a completely different composition is obtained with the process described in Govoni. There is no teaching or suggestion in Govoni to modify the disclosed process in order to arrive at the present invention. Contrary to that the teaching in Govoni, the present invention unexpectedly solves the problem of providing a process for the preparation of polymers having an improved scratch resistance.

In conclusion, the present invention teaches a completely different process having a specific combination of process steps. This process is not rendered obvious by the prior art. As the processes are completely different, the products obtained thereby are also completely different in their properties (as clearly stated in Govoni in column 1, lines 42-53 ("*It is in fact known that small variations in the operating conditions during the polymerization, resulting for example from small variations in the quality of the catalyst or of the olefin used in the reaction or from the dishomogeneity in the composition and in the flow rate of the gaseous mixture, can bring about changes in behaviour and catalytic activity of the polymer particles [...]*". (Emphasis added.)) Consequently, Applicants submit that the Office has not established a *prima facie* case of obviousness. As a result, they request reconsideration and withdrawal of this rejection.

CONCLUSION

Applicants respectfully contend that all requirements of patentability have been met. Allowance of the claims and passage of the case to issue are therefore respectfully solicited.

Should the Examiner believe a discussion of this matter would be helpful, he is invited to telephone the undersigned at (312) 913-2114.

Respectfully submitted,

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